Indirect measurements of cross sections via Trojan Horse Method

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Accurate knolowledge of termonuclear fusion reaction rates is crucial in pure and applied physics. Due to the precence of Coulomb barrier, the reaction cross section σ(E)nuclear drops exponentially with decreasing center-mass energy E. However, for nuclear reactions studied in the laboratory, the target and projectile orbital electron crouds produce a screening potential U_e: For $E/U_e > 1000$ schielding effects become important and experimental data show an exponential enhancement of the astrophysical S(E)factor, as observed in several fusion reaction. Experimental U_e values are usually extracted by comparing the electron-shielded S_s(E) with S_b(E), obtained from direct measurements. These U_e value are systematically much larger than the expected ones, deduced in the adiabatic limit. The Trojan Horse Method [THM] can be applied to determine the energy dependence of S_b(E), without the effects of the Coulomb barrier and electron screening. Indeed, if quasi-freee mechanism conditions are fulfilled, this method allows the extraction of S_b(E) by measuring the cross section of a proper three body process. In this way it is possible to determine U_e. The basic features of the THM are discussed togheter with a review of recent applications, aimed to extract the bare nucleus astrophysical S_b(E) factors for several two-body processes.

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